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AUTHOR Wallace, Stephen R.; Thompson, Thomas E.
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ABSTRACT

This study examined the change in preservice teachers' causal attributions for the success or failure of elementary students engaged in a hands-on science activity investigating electrical conductors. Subjects first viewed a videodisc capturing a complete science activity in a real classroom and were asked to indicate whether the elementary students acquired the desired concept and to make open-ended causal attributions for students' success or failure. The subjects (20 preservice undergraduate elementary education majors at a midwestern university) then listened to separate audio comments of students recorded shortly after the activity and 2 weeks later and then again indicated their perceptions of whether the concept was acquired and attributions. Students' audio comments indicated that the students did not acquire the concept of electrical conductors. Most of the elementary students retained their original concept of a conductor as a man on a train. Results indicated the preservice teachers changed their initial perception only slightly after hearing the elementary students' audio comments. Most held to the belief that the elementary students succeeded. There was a significant change after group discussion. Overall, 178 causal attributions were split between the teacher and the students. Student attributions were classified into learning activity, prior knowledge, motivation, ability, understanding, and knowledge of expectations. Teacher attributions were classified into classroom management, instructional strategies, and personal characteristics. (Contains 11 references.) (JB)

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PRESERVICE TEACHERS' CHANGING ATTRIBUTIONS FOR ELEMENTARY STUDENTS SUCCESS OR FAILURE

Stephen R. Wallace and Thomas E. Thompson

Northern Illinois University

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Abstract

The objectives of the study were to determine the change in preservice teachers' (subjects) causal attributions for the success or failure of elementary students engaged in a hands-on science activity. Subjects viewed a videodisc capturing a complete science activity in a real classroom and were asked to indicate whether the elementary students acquired the correct concept for the activity and to make open-ended causal attributions for their success or failure. The subjects listened to audio and visual comments of the elementary students indicating that they did not learn the new concept and were asked to make success-failure judgments and corresponding attributions. The subjects then engaged in a group discussion of the video and made judgments of success or failure, listing causal attributions. Results indicate that preservice teachers changed their initial perception only slightly after hearing the elementary students audio comments. Most held to the belief that the elementary students succeeded. There was a significant change after group discussion. 178 causal attributions were split between the teacher and the students. Student attributions were classified into learning activity, prior knowledge, motivation, ability, understanding, and knowledge of expectations. Teacher attributions were classified into classroom management, instructional strategies, and personal characteristics.

Preservice Teachers' Changing Attributions for Elementary Students Success or Failure

Weiner's attributional theory of achievement motivation has been used extensively to investigate perceived factors leading to one's success or failure (Graham, 1991; Weiner, 1985, 1994). The fundamental assumption of attribution theory is that human beings are motivated to find out why an event occurred, especially one that was unexpected or not anticipated. According to Weiner, the process of finding out why an event occurred begins with a search of the perceived causes of the unexpected success or failure. An unexpected event could be attributed to any number of possible causal attributions, but Weiner and others (Graham, 1991; Weiner, 1985) have been able to identify several prominent causal attributions that occur frequently. The two most common causal attributions are ability and effort; other causal attributions may include task difficulty, luck, a teacher, or interest.

Weiner (1985, 1994) further classified causal attributions by the underlying dimensions common to all causal attributions. He developed a classification system based on three properties of causal attributions called *causal structures*. The three causal structures are: (a) *locus of causality*, (b) *stability*, and (c) *controllability*. Every causal attribution has a locus of causality. Locus of causality is the source of the attribution, which can be either internal or external to the individual. An internal locus of causality indicates that the source of the causal attribution is a characteristic of the individual. An external locus of causality is one that is external to the individual. An example of a causal attribution with an internal locus of causality is ability—ability is considered to be a characteristic of an individual. An example of a causal attribution with an external locus of causality is when a student attributes failure on an exam to a poor teacher. In this case, the perceived cause for the failure is external to the student.

The second causal structure, stability, is the length of duration of a causal attribution. Some causal attributions are perceived as being stable over time and others are perceived as being relatively unstable over time. Ability is usually considered a stable individual characteristic because it is perceived as being stable and invariant (i.e., fixed) for

a particular task; but, some may consider ability as unstable if they perceive ability or intelligence as incremental. Typically, effort is viewed as an unstable characteristic because it can vary from task to task. At times, it also can be perceived as stable. An example in an achievement context is the student who perceives their ability to construct hypotheses in science as being stable over time and the amount of effort they exert in making observations in science to vary from time to time depending upon what they are observing.

Controllability, as the third causal dimension, describes the degree of control an individual has over a causal attribution. For example, effort and hard work are presumed to be under the control of the student, while ability is often not considered to be under the control of the student (ability on a task is perceived as being fixed and uncontrollable). Table 1 shows the relationship between the three causal structures and the two most prominent causal attributions, ability and effort (see Table 1). Each causal attribution consists of some combination of the three causal structures (i.e., locus of causality, stability, and control).

Table 1

Summary chart of the causal structures associated with the causal attributions of ability and effort

	Causal Attributions	
Causal Structures	Ability	Effort
Locus of Causality	Internal	Internal
Stability	Stable	Unstable
Control	Uncontrollable	Controllable

Note. From "A Review of Attribution Theory in Achievement Contexts," by S. Graham, 1991, Educational Psychology Review, 3(1), p. 8.

The causal structures that are ascribed to a causal attribution can have a significant impact on the emotional and psychological outcome of an event (Weiner, 1994). For example, if a student attributes failure at a given task to low ability, then future expectations

for success at the same or similar tasks will be lowered because ability has an internal locus of control, is stable, and is uncontrollable. The student perceives there is very little he or she can do to change future performances on the similar tasks. On the other hand, if a student attributes failure to a lack of effort (which has an internal locus of control, is unstable, but is controllable), then future success is under the direction of the student. Under effort-failure attributions, the student has the power to affect changes in the future; with ability-failure situations, the student may perceive herself or himself as powerless to affect changes in future performances. Future performance and motivation can be directly influenced by the causal attributions students make for unexpected events.

Beyond self-ascriptions of causal attributions, individuals may also infer causal attributions for another's success or failure (Graham, 1984; Juvonen & Weiner, 1993; Weiner, Graham, Stern, & Lawson, 1982). Weiner's (1985) hypothesis is that inferred causal attributions mediate the affective and emotional reaction individuals have toward others. For example, individuals may causally attribute someone else's failure to a lack of effort (a controllable causal structure) and become angry with the other individual; or, they may attribute failure to ability (an uncontrollable causal structure) and display pity or sympathy.

A major development to arise out of attributional research is the notion that causal factors and their underlying structures are perceived by individuals differently under differing contexts. Ability may be inferred as stable by one individual and unstable by another, and effort may be perceived as stable in one context and unstable in a differing context. As a result, investigators looking at causal factors for success and failure in new domains or contexts are encouraged to develop new attribution measurement instruments instead of relying upon instruments valid under differing conditions (Elig & Frieze, 1979; Russell, 1982). Elig and Frieze (1979) suggest the use of open-ended responses for success or failure attributions to establish a pattern of consistent attributions distinctive for a particular situation. Open-ended responses for measuring causal attributions avoid limiting

subjects to predefined factors and avoid cueing to nonspontaneous causal factors. Open-ended responses are preferred for pretesting to develop a valid structured measure. The structured measure can then be used to elicit the causal dimensions inherent in the new domain, such as preservice elementary teachers' causal attributions for the success or failure of elementary students engaged in a learning task under the direction of an experienced classroom teacher.

One purpose of this study was to determine preservice teachers' perceived causal attributions for the success or failure of elementary students engaged in a hands-on science activity. Specifically the questions of interest was: What causal attributions do preservice teachers' make for the success or failure of elementary students after viewing a hands-on science activity in a real classroom? Another purpose was to investigate when preservice teachers' change their attributions? Do they change after viewing the activity as it happened?; after hearing student comments indicating failure?; or, after group discussion?

A search of ERIC from the mid-1970's to 1994 did not reveal attributional studies examining the causal inferences preservice teachers' may make after viewing or witnessing a teacher lead a hands-on science lesson with elementary students. Given the modeling influence teachers have on the development of preservice teachers, it seemed prudent to investigate the common causal ascriptions preservice teachers give for student success or failure. An understanding of the causal structures may lead to improved teacher training.

Method

Participants

Subjects were 20 preservice undergraduate elementary education majors enrolled in an introductory educational psychology course at a midwestern university; 4 were male and 16 were female. Participation in the study was part of the regular instruction for the class and part of a required class project.

Materials

A 20-minute videodisc (Thompson, 1994) of a teacher conducting a hands-on science lesson to elementary students in a real classroom was used. The lesson was shown in edited form from start to finish. The elementary science teacher began the lesson by reviewing previous material, asked elementary students to define the concept for the present activity (electrical conductors), then led the elementary students through a guided discovery lesson investigating examples and non-examples of electrical conductors. The teacher finished by leading a class discussion of the results obtained by the students. The videodisc contained an audio track of the lesson as it happened and a separate audio track of elementary students' comments recorded shortly after the activity and two weeks later.

Procedure

After viewing the 20-minute videodisc, subjects were asked to indicate whether the elementary students had succeeded or failed at acquiring the concept of electrical conductors and to make open-ended causal attributions for their success or failure. The subjects were also asked to define an electrical conductor to ensure accurate assessment of the students' acquisition of the concept (see Appendix A).

After completing the first questionnaire, subjects listened to audio comments made by the elementary students during the lesson and 2 weeks after the lesson. The audio comments indicated that the students did not acquire the concept of electrical conductors. Most of the elementary students retained their original concept of a conductor as a man on a train. After listening to the comments, subjects were given a second questionnaire to indicate whether the elementary students had acquired the correct concept of electrical conductors and to make causal attributions for their success or failure (see Appendix B).

Following the second questionnaire, subjects engaged in small group discussion (4 to 5 per group) and a class discussion. The discussion was approximately 20 minutes in duration, free-flowing, student-directed, and focused on salient features of the lesson, namely classroom management and learning theory. Subjects were given the third open-

ended questionnaire asking them to indicate success or failure for the students and to make causal attributions (see Appendix C).

Scoring

The data indicating success or failure on the questionnaires was quantitatively analyzed with the McNamar test for significance of a difference between two correlated proportions (Ferguson & Takane, 1989). The causal attributions were coded qualitatively by developing a multi-stage classification system elicited through patterns of causal attributions. Initially, two researchers independently developed a deductive list of attributions from the subjects open-ended responses. They compared lists and agreed upon a set of possible attributions. After arriving at a consensus on a list of attributions, two researchers independently reclassified the subjects open-ended responses according to the list of possible attributions. Any differences were worked out until both researchers agreed on the classifications.

Results and Discussion

Indication of Success or Failure

As shown in Table 2, 19 subjects indicated the students succeeded at learning the concept of electrical conductors after viewing the videodisc for the first time and none indicated failure (see Table 2). One subject indicated both success and failure, and thus was eliminated from further analysis. After hearing the students' audio comments suggesting failure, 3 subjects changed their perceptions of students' success to failure. Two subjects were omitted because they indicated success and failure. After the group discussion, 9 subjects indicated success and 9 indicated failure.

Results of the study demonstrated a significant change from the first viewing of the videodisc to the group discussion (z=2.84, $p < .01$). It appears that the audio comments by the students suggesting failure did not have a profound impact on the subjects judgment of success or failure (z=1.74, $p < .10$). Only 3 changed their assessment and 15 held on to

TABLE 2

Preservice Teachers' Indication of Student Success or Failure

	Questionnaire		
Subject	#1	#2	#3
1	1	0	0
2	1	1	1
3	1	1	1
4	1	0	0
5	1	0 & 1	0
6	1	1	0
7	1	1	blank
8	1	1	0
9	1	1	0
10	1	1	0
11	1	1	0
12	0 & 1	0 & 1	0 & 1
13	1	1	1
14	1	1	1
15	1	1	1
16	1	1	1
17	1	1	1
18	1	1	1
19	1	0	0
20	1	1	1
Total	19 Succeeded 0 Failed	15 Succeeded 3 Failed	9 Succeeded 9 Failed

Note. 1 = success, 0 = failure.

their initial judgment. There was a modest, yet significant (z=2.24, $p < .05$) change from the group discussion that followed the audio comments. It is hard to determine in the present study if it was the combination of the videodisc and the discussion that followed or the discussion alone that was responsible for the change in judgment and causal attributions. Surprisingly, only one-half of the subjects changed their judgment of success to failure by the third measurement.

Causal Attributions

The subjects made a total of 178 causal attributions for success and failure that were classified into student causal attributions, teacher attributions, task, environment, and other (see Table 3). Student causal attributions were further broken down into student engagement during the learning activity, prior knowledge, motivation, ability, knowledge of expectations, and student understanding. Teacher attributions were further classified into classroom management, instructional strategy, and personal characteristics of the teacher. Initially, the two independent coders agreed on 88% of the subject's responses when classifying them according to the derived list of possible attributions. Subsequent conversations and analyses resulted in a 100% agreement.

TABLE 3

Summary of Success and Failure Attributions

	Questionnaire			
Attributions	#1	#2	#3	Total
Success				
Students	34	19	6	59
Teacher	44	23	16	83
Task	4	3	2	9
Environment		1		1
Other	2	6		8
Total success	84	52	24	160
Failure				
Students			8	8
Teacher			8	8
Task				
Environment				
Other		2		2
Total failure			16	18
Total attributions	84	54	40	178

On the first questionnaire, preservice teachers' attributed student success about equally between the students and the teacher. A shift occurred, however, as the number of students indicating success on subsequent questionnaires decreased. Those students that held on to their original indication of success attributed student success more to the teacher than to the students. Those preservice teachers' indicating failure were split equally between the students and the teacher.

The overall number of causal attributions decreased from 84 attributions on the first questionnaire to 40 on the third questionnaire. It may be that the preservice teachers were trying to hold on to their original belief as indications of failure mount, but were having difficulty supporting their original belief. It is also possible that the preservice teachers were becoming fatigued having to make three judgments of success or failure and the corresponding causal attributions in a short period of time.

As shown in Table 4, student success attributions were further classified into: student engagement in the learning activity, prior knowledge, motivation, ability, knowledge of expectations, and student understanding (see Table 4). It appeared the preservice teachers were generally making causal student attributions dependent upon the cognitive activity and behavior of the students. It is likely that some of the cognitive activity/lesson attributions may, in fact, be task-dependent attributions. Two examples of possible task-oriented attributions were that students engaged in hands-on activity and students engaged in trial and error. Some subjects attributed success to both the teacher and the students, suggesting preservice teachers perceive success or failure as being due to combination of several factors. There could also be interaction effects between multiple causal attributions.

Teacher attributions were classified into: classroom management, instructional strategies, and personal characteristics (see Table 5). The preservice teachers tended to attribute student success primarily to the teacher's instructional strategy. Initially, the teacher's ability to maintain classroom control and to prevent misbehavior (e.g., teacher

had control of the room, and teacher was organized and had a set of procedures) were key attributions for success but were quickly dropped when it appeared the students may not be succeeding as had been expected. Personal teacher characteristics were noted in the first questionnaire as being a prominent force in student achievement, but were also abandoned in the second and third questionnaire. Apparently personal characteristics, such as the teacher gave support and was motivational, were not as salient as the teacher's instructional strategies.

Table 4

Student Success Attributions

	Questionnaire			
Attributions	#1	#2	#3	Total
Engagement in learning activity	19	14	4	37
Prior knowledge	1			1
Motivation	7	1	1	9
Ability	5			5
Knowledge of expectations	2			2
Understanding		4	1	5

Table 5

Teacher Success Attributions

	Questionnaire			
Attributions	#1	#2	#3	Total
Classroom management	10	1	2	13
Instructional strategy	20	19	10	49
Personal characteristics	14	3	4	21

Student causal attributions for failure focused on student ability and understanding (see Table 6). For example, subject's attributed student failure to such factors as the students persisted with misconceptions or prior conceptions and the students didn't grasp

the concept. Only one subject attributed student failure to a non-cognitive student causal factor—namely, partners didn't work well together.

Teacher failure attributions were mostly instructional strategies with one subject indicating classroom management (see Table 6). Instructional strategies included such causal factors as the teacher not linking the current activity to the real-world and the teacher not calling on enough students.

Table 6

Student and Teacher Failure Attributions

	Questionnaire			
Attributions	#1	#2	#3	Total
Student				
Engagement in learning activity			1	1
Prior knowledge				
Motivation				
Ability			2	2
Knowledge of expectations				
Understanding			5	5
Teacher				
Classroom management			1	1
Instructional strategy			7	7
Personal characteristics				

Overall, it appears that preservice teacher's attribute student success and failure to both the students and the teacher. Causal student success factors differentiated into student engagement in the learning activity, prior knowledge, motivation, ability, knowledge of expectations, and student understanding. Student failure was predominantly attributed to student understanding and ability. Teacher success was dominated by instructional strategies and classroom management. Personal teacher characteristics, like enthusiasm, and classroom management were quickly given up as it became apparent students were not learning the concept of electrical conductors. Teacher failure was primarily attributed to

instructional strategy factors such as not linking the activity with real-world experiences or not calling on enough students.

Conclusion

The results of this study may shed light on the thought processes preservice teachers go through as they are confronted with changing perceptions of student success or failure. In particular, it is worth noting where inexperienced teachers focus their attention in situations of student success and failure. In the present study, preservice teachers tended to initially attribute student success during hands-on science activities to both the teacher and the students. But as the evidence accumulated suggesting student failure, preservice teachers held on to their notion of the teacher being responsible for student success and began to diminish their support for the students. Preservice teachers were as likely to attribute failure to the students as they were to the teacher. For example, before hearing the audio comments by the elementary students suggesting they did not learn the concept of electrical conductor, preservice teachers made 44 teacher attributions and 34 student attributions—the teacher appears to have a little more responsibility for student success. After the group discussion centering on the salient features of the lesson, preservice teachers made 16 teacher attributions for success and only 6 student attributions for success. Of those indicating failure on the last questionnaire, there were 8 student attributions for failure and 8 teacher attributions for failure.

It appears that inexperienced elementary science teachers tend to think of teachers as responsible for student success and students responsible for student failure. It was somewhat surprising to see preservice teachers "blame" students for their lack of success when teacher controllable attributions were primarily responsible for student failure. It would be worth pursuing in future research the dimensional structures of the attributions uncovered in the present study. Perhaps inexperience, novice teachers have naive concepts about the amount of controllability and causality teachers have on instructional settings and

learner outcomes. Preservice teachers need to be informed on what factors in student achievement are controllable from the teachers perspective and what factors are not.

From this study, it should be possible to develop a valid measurement instrument designed to assess the preservice teacher's causal ascriptions to student success or failure. Ideally, a semantic differential scale similar to Russell's (1982) Causal Dimension Scale could elicit the causal dimensions underlying the causal attributions preservice teachers make. It may be possible to add to Weiner's attribution theory of achievement motivation if it is shown that the causal dimensions are in fact the locus of causality, stability, and controllability.

If preservice teachers attribute student failure to the teacher, specifically a controllable factor such as instructional strategy, then one could predict from attribution theory (Juvonen & Weiner, 1993) that preservice teachers may feel anger towards the teacher. Or, if preservice teachers attribute failure to the students, in particular to a lack of ability and understanding, then the preservice teachers may display sympathy towards the students. Perhaps teacher educators could strongly impact the shifting preservice teacher's attributions for observed student success or failure by inferring causal factors with affective cues. Given the proportionally high number of students in the present study that attributed failure to low student ability and a lack of understanding, it would be desirable to shift their causal attributions to controllable teacher factors such as classroom management and instructional strategy.

It would be fruitful to examine the pattern of changes that may exist between the novice, preservice teacher and the expert teacher's causal attributions for student success or failure in hands-on science activities. Questions to investigate include: (a) Do expert teachers notice controllable factors that novices miss?; (b) Do novices disproportionately attribute student failure to uncontrollable factors like student ability?; (c) Is there a typical progression that teachers go through to become experts?; and (e) How could teacher training programs effectively assist novice teachers in the transition to becoming experts?

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Appendix A

Questionnaire #1

Directions:

1. Please indicate your full name:_____

2. After watching the 20-minute videodisc scenario of the elementary school students engaging in a science activity would you say that the elementary school students succeeded or failed at learning the concept of electrical conductors?

   You must **circle** the answer that best describes your response:

   Succeeded Failed

3. **List** several things that you attribute their success or failure to:

4. Please **describe** what an electrical conductor is:

Appendix B

Questionnaire #2

Directions:

1. Please indicate your full name:_____

2. After listening to the audio and video clips of the elementary school students responding to the questions posed to them after completing the science activity would you say that the elementary school students succeeded or failed at learning the concept of electrical conductors?

   You must **circle** the answer that best describes your response:

   Succeeded Failed

3. **List** several things that you attribute their success or failure to:

4. Please **describe** what an electrical conductor is:

Appendix C

Questionnaire #3

Directions:

1. Please indicate your full name:_____

2. After discussing the 20-minute videodisc scenario and the audio and video clips of the elementary school students engaging in a science activity would you say that the elementary school students succeeded or failed at learning the concept of electrical conductors?

   You must **circle** the answer that best describes your response:

   Succeeded Failed

3. **List** several things that you attribute their success or failure to:

4. Please **describe** what an electrical conductor is: